My work in the field of Carotid Revascularisation

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Professor of Vascular Surgery
University of Oxford

Nucleus member, ESC Council on Stroke
President-elect, European Society for Vascular Surgery

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CV and Competed Work

Training - General and Vascular Surgery, UK, US, Hunterian Professorship, Royal College of Surgeons Travelling Fellowship, Germany, France, US

Consultant Surgeon (NHS) 1991-2008

Professor of Vascular Surgery 2008 – current

University of Oxford/Oxford University Hospitals 2010 – current

President-Elect, European Society for Vascular Surgery 2016-17

Principal Investigator, Asymptomatic Carotid Surgery Trial-1 (1993-2008)

RCT, 3000 patients, early surgery (CEA) and medical treatment vs medical treatment alone with 10-yr follow up (incorporated into many Guidelines)

Instigator and Lead developer, National Carotid Audit (2000-2010)

20-centre pilot, then National rollout, all UK, carotid surgery data and outcome collection, now National standard, compulsory for all UK surgeons and Vascular Surgery departments

Current work

Asymptomatic Carotid Surgery Trial-2 (ACST-2) 2008-20

RCT, Carotid Endarterectomy (CEA) vs Carotid Stenting (CAS) patients, tight carotid stenosis (no recent ipsilateral symptoms) thought to need revascularisation

IPD Analysis of ACST-1, ACAS, VA trials 2016/17

5222 patients, 3 European and US trials, completed 2016, Risk model development 2017
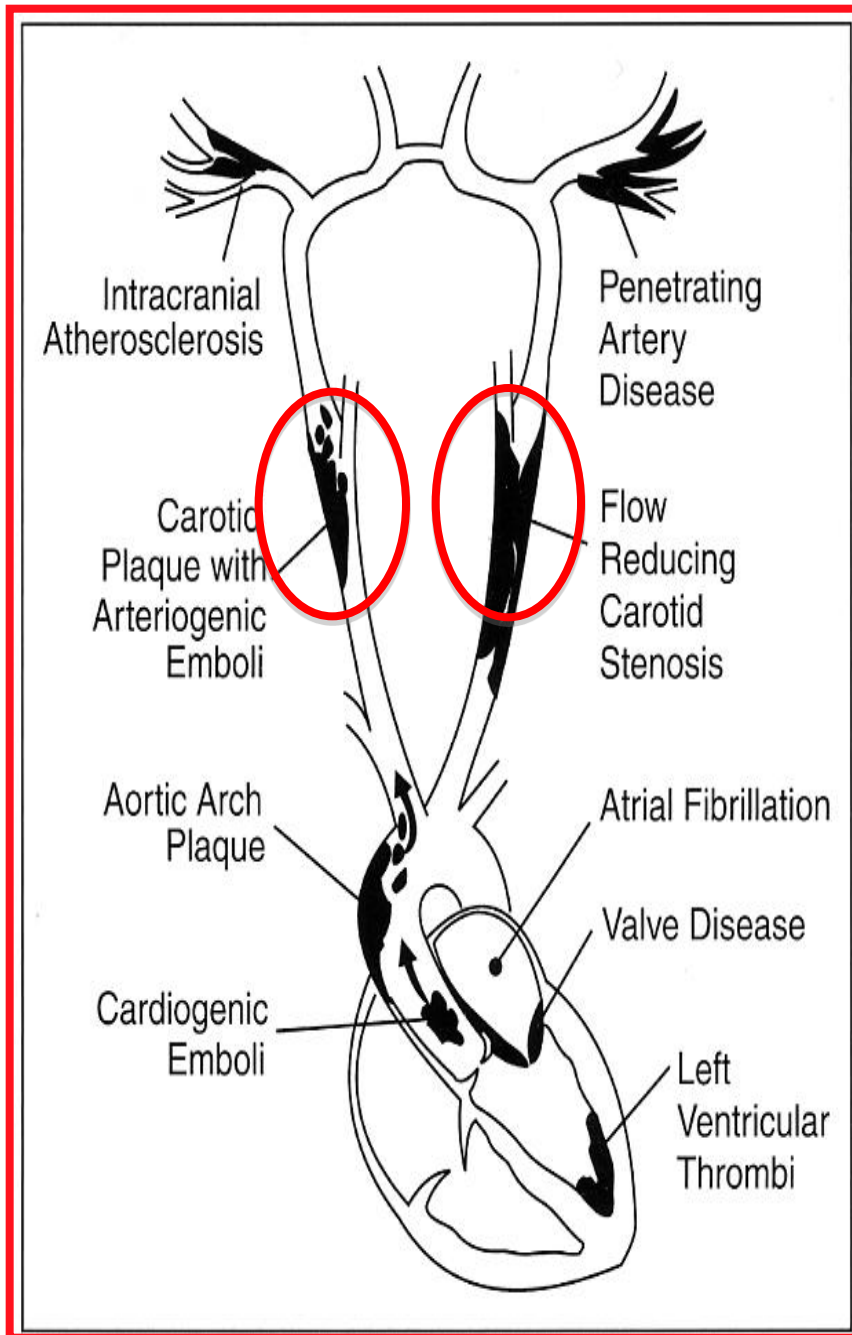
Development of Dementia 2016-18

1600 UK and Swedish ACST-1 patients (CEA vs not, 12-22 years after trial entry) Data from hospital, country, patient relatives
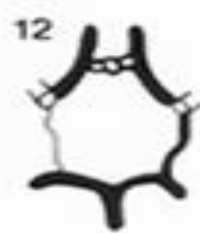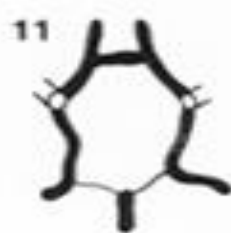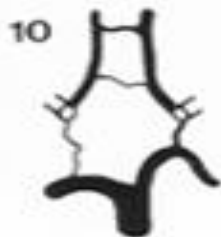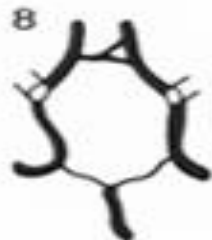
Screening data analyses 2015-17

Lifeline Vascular Screening data (4m UK and US adults AAA, Carotid stenosis, AF and PVD

Big Data linkage Pilot 2017 –19 UK Vascular lab carotid data

Intracranial Atherosclerosis

Penetrating Artery Disease

Carotid Plaque with Arteriogenic Emboli

Flow Reducing Carotid Stenosis

Aortic Arch Plaque

Atrial Fibrillation

Valve Disease

Cardiogenic Emboli

Left Ventricular Thrombi

About 20% ischaemic Strokes are caused by carotid stenosis

Variations In the Circle of Willis

Strokes do not always occur ipsilateral to that tight stenosis!

Lifeline Screening

- Self-funded testing(cost about $200)
- Includes Carotid, AF, PAD, AAA, BP, Cholesterol
- 8m adults US, UK Ireland, Australia

- Data processed on >3M

- The LLS population is:
  – Older (median age: 65y)
  – Female (~ two-thirds)
  – Caucasian (almost 90%)

Characteristics of participants

	Men (1.1M)	Women (2M)
Age (years)		
<60	36%	32%
60-69	35%	36%
70+	29%	32%
Height, m	1.78	1.63
Weight, kg	91	73
BMI, kg/m^2	28.4	27.7
SBP, mmHg	132	133
Current smoking	8%	8%

Associations between smoking and carotid stenosis and atrial fibrillation

among adults
without reported history of CHD or stroke

IPD Meta-analysis of VA, ACAS and ACST-1 Trials: 5000 patients randomised to Immediate CEA vs Medical Therapy alone

Alison Halliday, Richard Bulbulia, Peter Rothwell,
Richard Peto, Hongchao Pan on behalf of VA, ACAS,
ACST-1 and CSTC
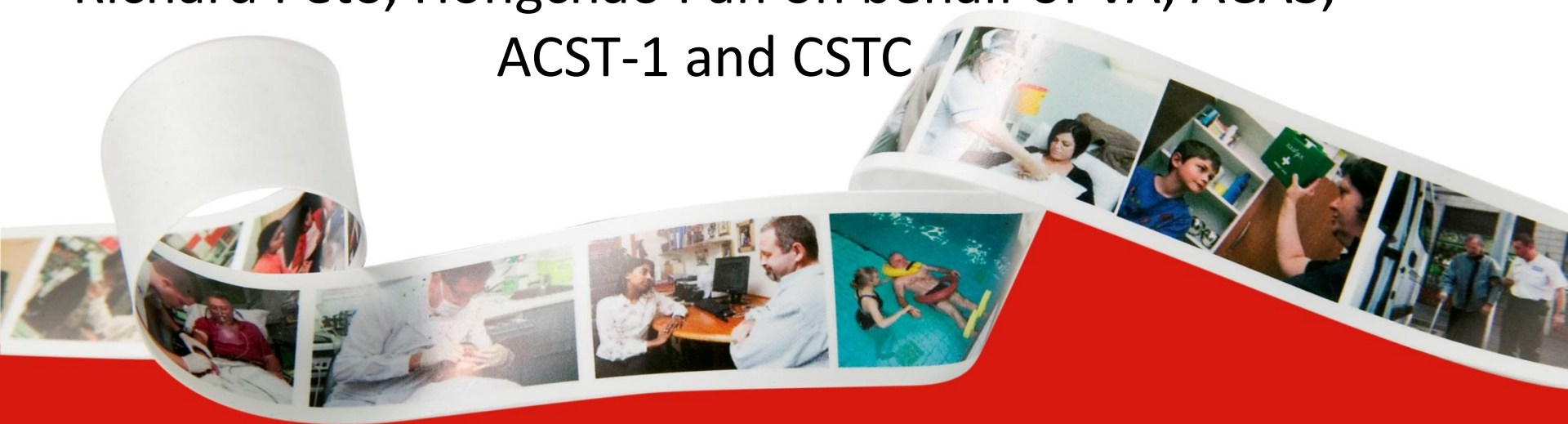
Prevalence of 'serious' carotid stenosis

Systematic review, de Weerd, 2009

Adults over 70 years:
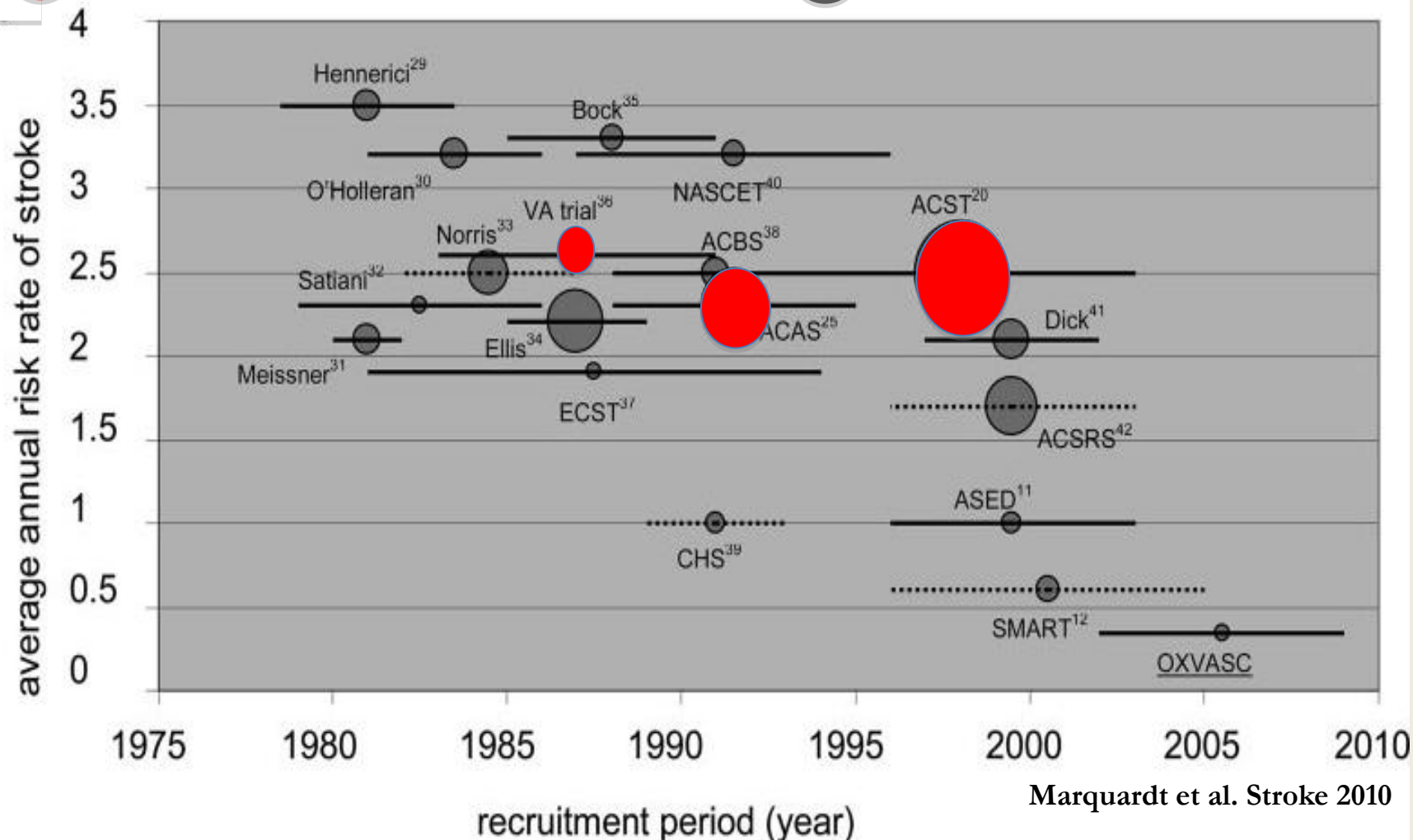
≥70% stenosis ~ 3% women

5% men

≥50%   **7% women**

12% men

Annual Stroke risk from asymptomatic carotid stenosis

Marquardt et al. Stroke 2010

Methods

5,000 individual patients
in ACST-1, ACAS and VACS Trials

	VACS	ACAS	ACST-1
Nos. of patients (Immediate vs Deferred)	444 (211 vs 233)	1662 (828 vs 834)	3120 (1560 vs 1560)
Period of randomisation	**Apr 83** – Oct 87	Dec 87 – Dec 93	Apr 93 – Jul 03
Date of last follow-up	May 1991	Feb 1997	**May 2008**
Median (IQR) follow-up year†	4.5 (2.5-6.0)	4.2 (2.9-5.0)	6.1 (3.9-9.1)

† Median year of follow-up, as measured from the time of entry to that of the first stroke, death, loss to follow-up, or most recent examination

What CEA adds to drug therapy over the next 5-10 years after trial entry?

Statins work: With CEA or without CEA,
a statin approximately <u>halves</u> the stroke rate

And CEA works: With a statin or without a statin, CEA approximately <u>halves</u> annual stroke rate

Who benefits and which strokes are prevented?

**60-99% asymptomatic carotid stenosis:
intervention vs medical treatment –
what has changed between the 1990s and the 2010s?**

Medical treatments have improved….
But only statins have made a real impact on stroke risk

For truly asymptomatic patients with tight stenosis (60-99%)
but no past symptoms and no brain infarcts, annual stroke
risk may now be around 1.0%, but for patients with risk
factors such as previous symptoms, it may be 2-4%...
**during 2017 we will report details of a simple model to
identify these higher risk patients**

Risks from intervention have also fallen, but a decision to
intervene depends on operator skill, proper patient
assessment and good medical therapy before any
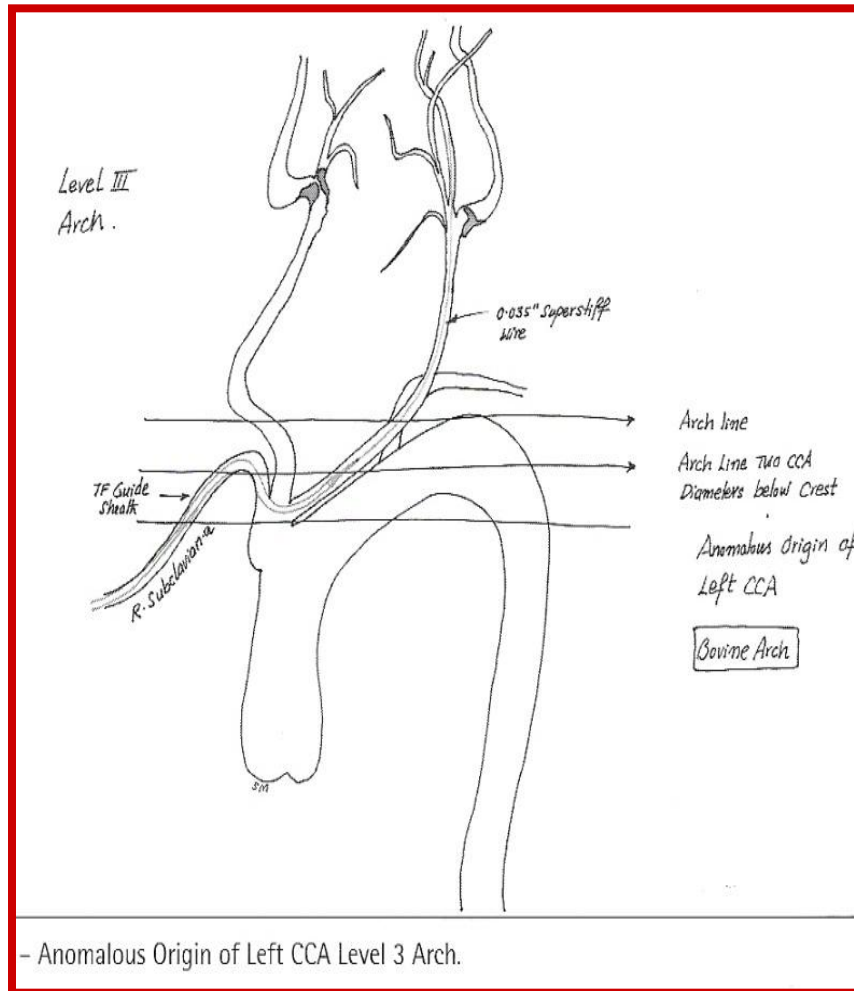intervention is undertaken

Risk of future Dementia following CEA (or not) in patients with tight asymptomatic stenosis in ACST-1

ACST-2 – A large RCT comparing open and endovascular treatment of severe carotid stenosis

Progress after 2400 patients

For patients thought to require intervention ACST-2 directly compares CEA vs CAS

Level III Arch.

0.035" Superstiff Wire

TF Guide Sheath

R. Subclavian

Arch line

Arch Line Two CCA Diameters below Crest

Anomalous Origin of Left CCA

Bovine Arch

– Anomalous Origin of Left CCA Level 3 Arch.

If patient is suitable for *both* procedures
- then randomise

Long-term follow up is of most importance to compare stroke prevention

Stent type	Name	% used
Closed Stents **(410)**	Wallstent	25%
	Xact	17%
	Adapt	1%
	Precise	14%
Open **(330)**	RX Acculink	10%
	Protégé® RX	9%
	ViVEXX	1%
	Zilver	<1%
Hybrid **(174)**	Cristallo Ideale	17%
	Sinus Carotid RX	1%
	Medtronic Invatec	<15
	MER	<1%
Membrane	Roadsaver	2%
(32)	CGuard	1%
Total		**n = 946**

Time trends in Stent use
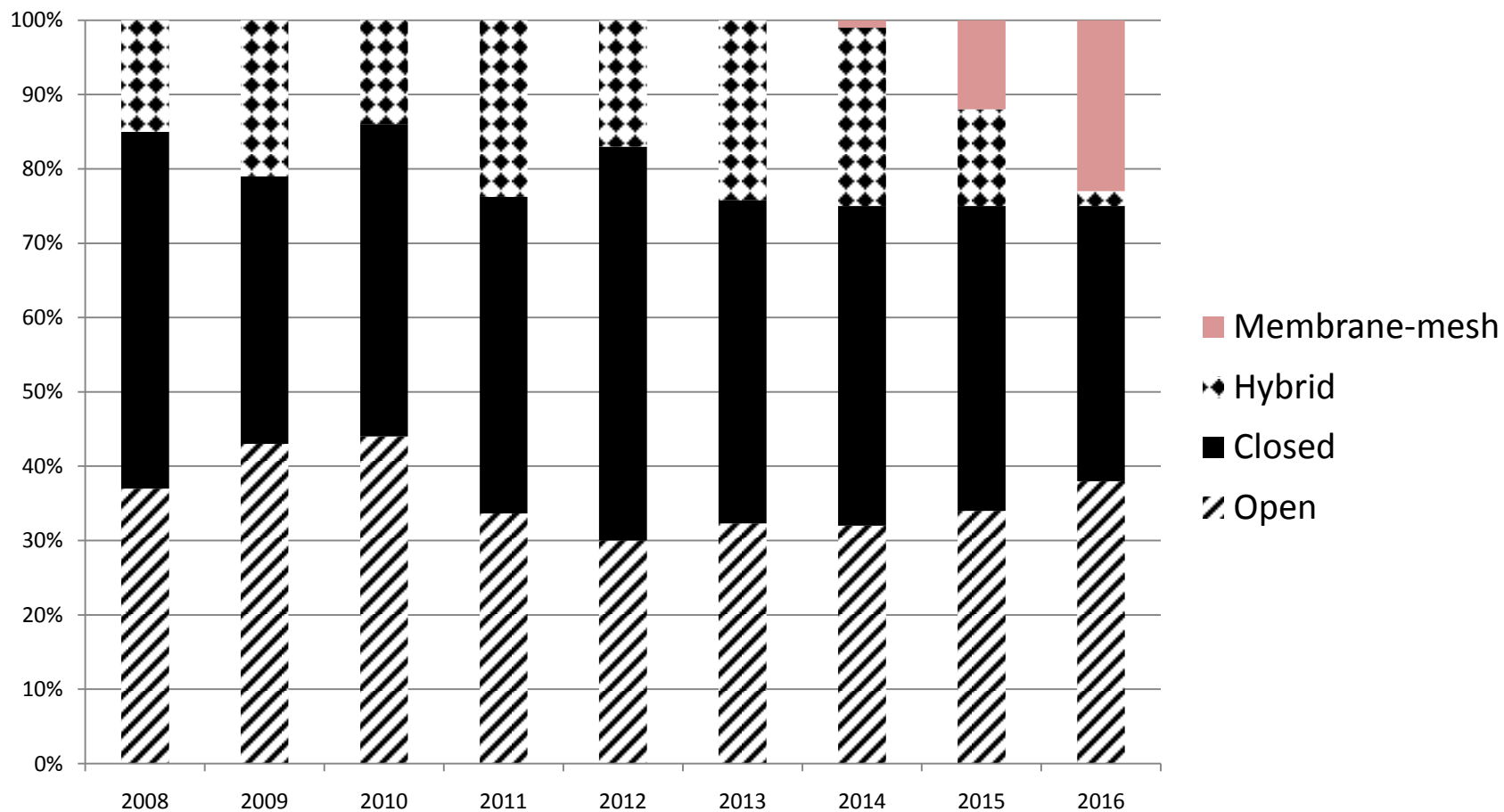
Type of Cerebral Protection Device	Device Name	% of total
Filter (633)	Emboshield	23%
	Filterwire	19%
	Spider	13%
	Accunet	7%
	AngioGuard	5%
	FiberNet	<1%
	Wirion System	<1%
Proximal occlusion (166)	Moma	15%
	Gore Flow Reversal	3%
Distal balloon (4)	Twin One	<1%
	Viatrac	<1%
None (143)		15%
Total		**946**

ACST-2 procedural hazards
much lower than in symptomatic trials (CEA+CAS) and lower than in ACST-1

Disabling and fatal Stroke/MI ≤ 30 days:

1.0% (ACST-2)

Lower than in previous trial of CEA
1.7% (ACST-1)

Current Recruitment - 2400
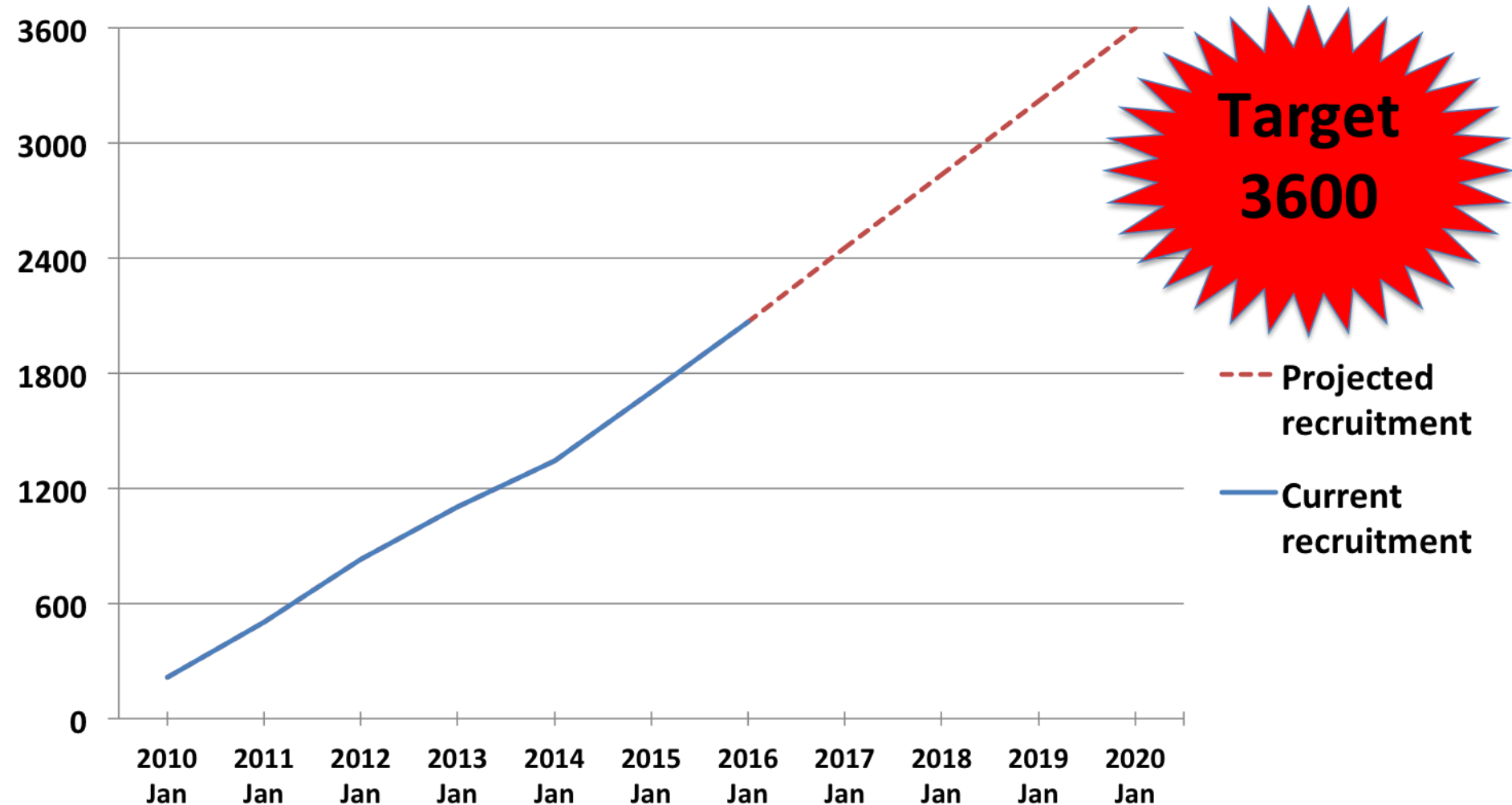
ACST-2
A very European Trial

Over 30 countries

Large Network:
Neurologists
Surgeons
Cardiologists
Radiologists

Work in the field of carotid revascularisation -

Surgeon
European Stroke Networker and Researcher